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A MANAGEMENT INFORMATION SYSTEM
FOR SMALL BUSINESS

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A THESIS

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The undersigned certify that they have read, and recommend
to the Faculty of Graduate Studies for acceptance, a thesis entitled

A MANAGEMENT INFORMATION SYSTEM FOR SMALL BUSINESS,
submitted by Joseph Robert Doherty in partial fulfillment of the
requirements for the degree of Master of Business Administration.

ABSTRACT

Management information systems have gained in importance as the complexity of modern business has increased. To date, however, the concept has been presented at a high level of sophistication, thus barring its use to small companies whose finances and expertise are lacking. The need for a systematic treatment of data to provide information for management within small companies is in many cases acute.

This thesis presents a method of producing a management information system that would have general application to companies of widely varying needs and limited resources. Attention is given to presenting the concept in a form understandable by management rather than in the jargon of the data processing specialist.

It is hoped that from the outline presented here, both management and the systems analyst can develop the details to apply this system to their needs.

The actual programming of this system is a highly technical task. Once programmed, however, this management information system could be used quite easily and economically by small business.

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INTRODUCTION

Much has been written in recent years about something called a "management information system" or M.I.S. The concept of M.I.S. has received much publicity and has been greeted with varied reactions. Since the time that M.I.S. was first invented during the Second World War, computing journals and business periodicals have presented hundreds of articles about it. Many of these articles, however, although ostensibly geared to inform the businessman, have created some confusion and many misgivings about the practicality of the management information concept.

There are now numerous different types of management information systems in operation. There is, however, a prominent feeling of discontent with the state of information systems in general. What progress has been made by business people in implementing management information systems, has been made by large, sophisticated businesses and has been concentrated primarily in the area of financial or accounting systems.

Until very recently with the introduction of systems like IBM's System/3, little progress has been made toward implementing management information systems for smaller, less sophisticated businesses. The benefits of M.I.S. to these companies, however, may be as great. The reasons why moderate-sized firms have not begun to use management information systems appear to be three. The first reason is a lack of understanding of the concept of management

information systems and the advantages to be received through using M.I.S. A second reason is a lack of funds and knowledge to implement the complex systems that have been discussed so much in the last few years. And the third reason for the slow development of M.I.S. in these firms is a lack of concern on the part of management information specialists with implementing small scale systems that would be of assistance to moderate-sized businesses.

It is the purpose of this paper to present a basic management information system that can be practically implemented by small (and large) businesses and that does not require a large outlay of funds on the part of the user nor computer expertise. A basic hypothesis of this paper is that the system to be presented here can provide the basis for the complete information needs of a company. Although the system may be implemented in its most basic form, it can be made more elaborate as needs and the level of sophistication of the user become greater.

Before presenting this management information system, it may be beneficial to first examine the need for information systems and determine just what a management information system is.

The Need for Information Systems

As businesses and industry become more and more complex, the need for information or data becomes increasingly great. Ever increasing numbers and types of inputs must be recorded on business forms such as invoices, sales slips, or purchase orders. Information

about these transactions will be required either internally by management or operating personnel, or externally by customers, creditors, investors, or government agencies.

Management requires various forms of this information for decision making, planning, co-ordination and the controlling of the activities of the organization. If these activities are to be carried out effectively, accurate information or data is of the utmost importance. There must be some information "system."

An information system could be defined as a system of record keeping that presents some picture of what has happened to the economic and other affairs of a business by first processing the information inputs of the business in some way.¹

Even though business executives are aware of the endless need for factual data, there has been a lack of constructive movement on the part of businessmen themselves to improve their information systems. H. S. Gellman, writing in Cost and Management, states that ". . . many companies spend large amounts of time and money improving their manufacturing and marketing operations but pay little or no attention to their information processes."²

Information systems in the past have operated seemingly oblivious to the needs of management. Data contained in them has

¹For more discussion of information systems, see: C. O. Elliott and R. S. Wasley, Business Information Processing Systems (Homewood, Illinois: Richard Irwin, Inc., 1968), pp. 35-61.

²H. S. Gellman, "Improving Management Information Systems," Cost and Management, September, 1968, p. 20.

been faulty or insufficient for the needs of decision makers. Written records within information systems were often limited to information required for the accounting function.

Today, the computer provides the ability to go beyond the accounting-type or "custodial accounting systems"³ as they are often called. The tremendous storage capacity of computers makes it possible to store large amounts of information which can be recalled at a moment's notice to aid in the planning and control functions. A system that can take advantage of these facilities is often called a "management information system."

What is a Management Information System?

Over the past ten years or so, companies have gradually turned to computers to handle many of the repetitive accounting functions. One by one, the various accounting applications were converted to data processing as time and resources permitted. These conversions were usually made independently of one another and there was little attempt to integrate them into a single system.

A more recent concept has been to process accounting information for uses other than just the accounting functions. It became logical to expect accounting data to be presented in a form useful to management for decision making. The emphasis changed from historical record keeping to the processing of information requests as required and on demand.

³Elliott and Wasley, Business Information Processing Systems, p. 35.

Figure 1 shows the type of information system that is now utilized. The base of the triangle represents the data base for the entire system. It is this data base that provides all the accounting data in the same manner as older systems. This accounting data is utilized further up in the triangle by middle and top management in some different form.⁴

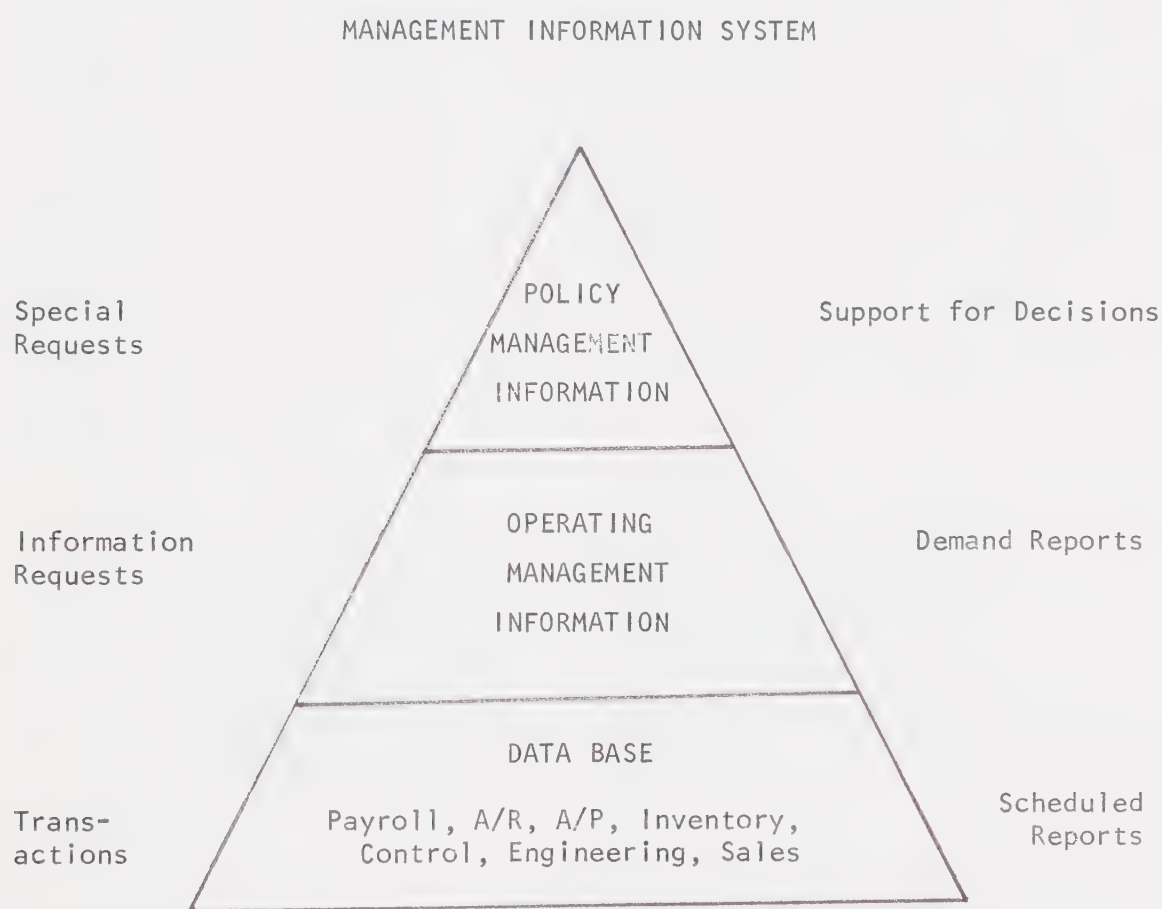


FIGURE 1

⁴Robert V. Head, "Management Information Systems: A Critical Appraisal," Datamation, May 1967, p. 22.

Best use can be made of the data base when the management information system has been well planned and correctly implemented.

Although our diagram serves to define M.I.S., a verbal definition is more difficult. The reason for this is simple. The information requirements of each company, and in fact each manager within the company, are different. To Lynn Townsend, the Chairman of the Board of Chrysler Corporation, his morning report showing the number of units produced the previous day compared to same day last year, is part of his information system.⁵ To a marketing manager, the news that eight per cent of his sales is coming from twenty per cent of his products, is management information. Yet, a report showing that a company now has the industry's largest parts and accessory catalogue, may not form a part of either man's management information system.

Management information is a system in which the requirements at each level of management are carefully determined in advance of need and are then produced from an integrated system at pre-determined times and in a form suitable for the following purposes: (1) for setting objectives, (2) for shaping and evaluating alternative strategies, (3) for making decisions, (4) for measuring results.⁶

⁵Jeremy Main, "Chrysler's Well-Ordered Comeback by the Numbers," Fortune, November 1968, p. 167.

⁶R. A. Kronenberg, "Weyerhaeuser's Management Information System," Datamation, May 1967, p. 28.

Some of the confusion surrounding M.I.S. can be alleviated if we view all such systems as being composed of two components: the support system and the operating system.⁷ The support system includes those activities required to generate and manipulate data (for example, data gathering and programming), while the operating system is that portion of the overall system that uses the data as an aid to planning and controlling company activities.

Concern with the support system can be left almost entirely up to the technical specialists, thus freeing the company managers from any deep involvement in the technical aspects of M.I.S. This will be the basic approach of this paper. Those managers who do not realize that they need not give prime concern to the support portion of M.I.S. generally regard management information systems as too complicated for their company.

The more familiar that management personnel are with the problems of their technical specialists, however, the better will be the communication between the two divisions. For this reason, it is highly desirable that executives become as knowledgeable about the technical aspects of M.I.S. and data processing as possible. As the

⁷The support system/operating system dichotomy is quite a common distinction in practice but is seldom pointed out in the literature on the subject. In my opinion, lack of understanding of M.I.S. can usually be attributed to confusion regarding the technical aspects of the subject. For more discussion see: Donald F. Cox and Robert E. Good, "How To Build A Marketing Information System," Harvard Business Review, May-June 1967, pp. 145-146.

management information system being utilized by a company becomes more complex and begins to make use of some of the techniques of management science, the technical knowledge of management also must increase.

As a good generalization, the executive who begins to perform in the capacity of technical specialist rather than as a manager in the designing and implementation of management information system, will likely become bogged down by details and will progress very slowly with the total system.

Both the support system and the operating system will be dealt with in this paper, although concentration will be given to the details of the support system. As will be pointed out in the following chapter, a basic concept of this system is that the support system will be designed to make the operating system as simple and easy to use as possible.

CHAPTER I

THE CONCEPT OF THE SYSTEM

There presently exists a gap between current knowledge about techniques of management information systems and common practice. It is the objective of the management information system presented here, to provide moderate-sized businesses with a tool by which the information already available to the firm (or not presently available) can be gathered, sorted, summarized and presented in forms most useful to the management of the firm. Like most other management information systems, the accounting system of the firm provides the basis for the information system. The accounting records are rearranged and merged with other data to provide information of broader concern than the accounting records from which the information was obtained.

Although the system presented here is somewhat simpler in concept than most other forms of management information systems, it can exhibit all of the characteristics of a well-designed management information system. According to H. S. Gellman, the characteristics that must be exhibited by a well designed system are:¹

1. Supply complete, accurate and timely data.

¹H. S. Gellman, "Improving Management Information Systems," Cost and Management, September 1968, pp. 20-21.

2. Report only the necessary levels of detail.
3. Present data to the decision maker and planner in a form that minimizes the need for further analysis and interpretation.
4. Meet the needs of each organizational unit as well as the needs of the organization as a whole.
5. Merge financial and production data to help measure performance, control costs, and facilitate planning decisions.
6. Identify, structure, and analyze significant past events and forecast future events through the use of advanced mathematical techniques.
7. Present information uniformly and consistently.
8. Use people and machines effectively to achieve optimum speed and accuracy at lowest cost.
9. Provide flexibility - adaptability to change.

As will be pointed out as this system is described in further detail, much of the design of each firm's management information system is left in the hands of the firm utilizing it. The system itself provides the ability to use its components in numerous ways, and it also provides a means for linking other components from outside the system to the system itself.

Simplicity for the User

A major objective in designing this system was to create a system that was easy for the user to learn about and use. There should be no need to delegate the work involved in utilizing this system to computer experts, although companies now employing these

people would no doubt make use of them. Rather, people presently employed in the firm doing manually (or by machine) what the M.I.S. would assume, should be well qualified to handle the operating-system portion of the overall system. They would require only a basic understanding of data processing and a knowledge of the abilities of this system.

The support-system component, on the other hand, requires highly trained data processing systems, and programming personnel to initially program and implement the system. Once this initial programming is completed, however, any number of companies can utilize the programs. The most practical way for the small business to utilize this system would be on a data-center basis. An existing data center or a data center created as a pooling of resources of several potential users of the system, would handle the support system, leaving the design of the operating system of each user's M.I.S. to the individual company.

Machine Requirements and Costs

This management information system is not designed specifically for any one computer or family of computers, but rather is intended to be implemented on any moderate-sized commercial computer. Although a computer system employing only tape storage and no random access devices could be used for this application, typical of a more efficient configuration would be:

IBM Model 30 Central Processing Unit

2 Disk Drives

4 Tape Drives

Reader / Punch

Printer

More sophisticated equipment such as a faster central processing unit, and extra on-line storage would add to the overall efficiency of operation.

The "computer-utility" concept of processing, that is becoming increasingly popular today would be ideal for the operation of this system. General users of the management information system could pool their resources to support one common computer facility and would share in the cost of its operation. Typical of such an arrangement would be a twelve-company consortium renting an IBM Model 30 system similar to the one suggested above. The monthly costs would break down as follows:

Monthly Costs

Equipment Rental

IBM Model 30 - 16K	
2 - 2311 Disk Drives	
4 - 2401 Tape Drives	
1 - 2540 Reader Punch	
1 - 1403 Printer - 800 lines per minute	\$ 4,000

Data Processing Staff

Manager	1,000
Systems Programmer	800
Programmers (2 at \$600)	1,200
Operators (2 at \$350)	700
Key punch operators (3 at \$300)	900
	<hr/>

forward \$ 8,600

forward	\$ 8,600
Rental of space	500
Supplies	<u>500</u>
Total Monthly Cost (for 12 companies)	\$ 9,600
Total Monthly Cost per Company	\$ 800

As various companies would make greater use of the facilities than others, there would be an accounting system to charge each user a variable portion of the total costs according to usage. Since this single application likely would not fill the total available computer time, other applications or other users could help absorb a portion of the monthly costs.

The initial programming costs to get this system operational are less easily estimated, but a figure of \$20,000 to cover one man-year of programming at \$10,000 per year, and an equal amount for machine time for testing would likely be a conservative estimate of costs.

Modularity and Flexibility

As a general rule, the designing of a truly sophisticated management information system in the beginning will no doubt fail.² It is usually best to implement a well-designed basic system of a

²John Dearden, "How to Organize Information Systems," Harvard Business Review, March-April 1965, p. 65.

modular nature that can be added to as members of the organization become more sophisticated in their use of it.

Most well-read managers today know that M.I.S. makes use of such concepts as decision theory, model building, simulation and management by exception. What many managers fail to realize, however, is that all of these concepts are useless without a sound data base on which to apply these concepts. The techniques cited here add a great deal of sophistication to a workable basic system. This paper is concerned with presenting a technique for establishing a basic system to which more complex techniques can be applied later.

This system is flexible enough so that the basic system developed by each user will be unique to that user's requirements. As requirements change or become greater, changes in the systems or additions to it can be made with a minimum of difficulty. The information that comprises each user's basic system is dependent upon (1) the information requirements of the firm, (2) the level of sophistication of the user, and (3) the economics of providing the input to the system and processing it.

The Abilities of the System

Although the remainder of this paper will be devoted to explaining the details of this management information system and its operation, a brief outline of the capabilities of the system can now be given.

1. It will read predefined records and files.
2. It will printed formatted lines of 132 characters or less.
3. It will select records for processing according to instructions given by the user.
4. It will sort files into defined sequences.
5. It will summarize information.
6. It will create new records.
7. It will perform certain logical operations, such as equal, greater than, or less than.
8. It will perform certain arithmetic operations, including:

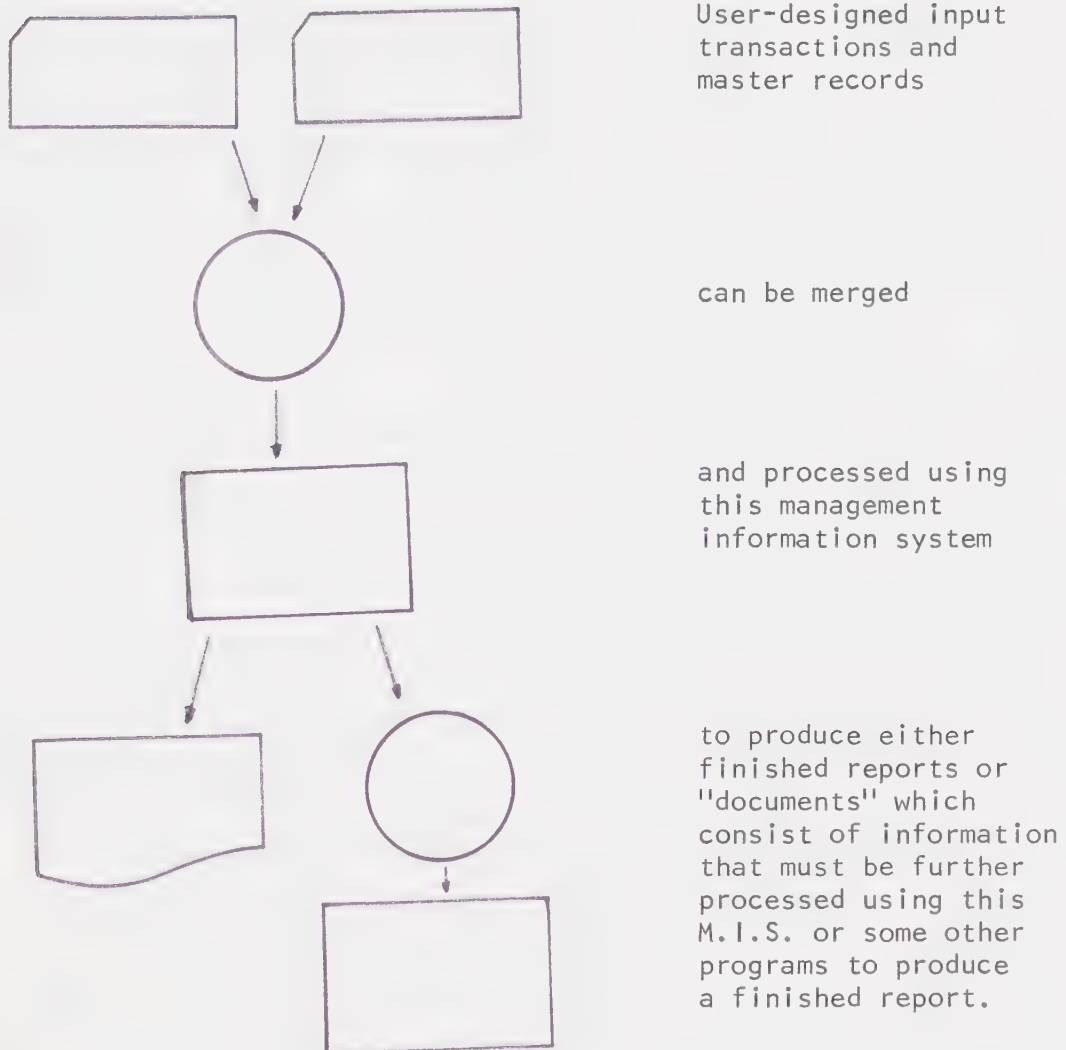
add; subtract; multiply; divide.

In addition to those aspects of processing that are available in the system, the user is able to customize the system to his requirements by specifying:

1. Input formats.
2. Contents of all files and records.
3. Coding system.
4. Output format.
5. Timing of processing
6. Level of sophistication.

System Summary

The overall concept of this system can be summarized using a simplified systems chart of its operation.



For a more detailed systems chart that outlines the procedures of a typical system using this version of M.I.S. refer to Appendix A. A description of each step is included for readers who are not familiar with systems charts.

CHAPTER II

INPUT TO THE SYSTEM

Two basic inputs must be provided for this Management Information System. The first, detail information, will present the variables that will be used repetitively to produce the final product of this system. Master information, on the other hand, will be required to provide historic data as well as to specify the outline for each job and the instructions for carrying it out.

Detail Information

Since detail information is required by any system to gain meaningful data, it is most easily recognized and understood. It will be dealt with first. Although this M.I.S. can be designed to include much more than accounting data, it is convenient to use accounting entries to initially explain the workings of it.

Fundamental to this system is the idea that the user should be required to make only a minimal amount of changes in his existing procedures in order to utilize this system. With this in mind, the system will accept input in much the same form as would be required by a manual system or another computerized system. That is, this system will process information from coded invoices, cheques, cash receipts and vouchers, and will accept journal entries of conventional design.

The primary consideration that must be given to input

formats to be used, is the detail that will be required later as output. In some cases, it will be most efficient to expand the existing coding block to include a finer breakdown of entries than was previously used, to provide the input to detailed output reports.

Following are samples of the type of input that might be designed by the user of this system, as well as a description of how these entries would be prepared by a card punching operator or tape encoder.

This layout would describe a single input entry or card. The method of producing this record would vary slightly depending on whether the original document was a coded invoice, a journal entry, or some other source document. The card punch operator would have instructions to allow her to pick up this information from various spots on different documents. The completed record, however, would always take this identical format.

CODED DOCUMENTS

A major portion of the original input into this system would be in the form of source documents that are coded, using a coding stamp such as the one shown.

Many companies would presently use a coding stamp or block with less detail than this. The time required to create more coding would be well spent. Data such as date and reference number would already appear on the document itself and would not have to be re-entered as the card punch operator would have instructions regarding data needed off of the document itself.

A CODING STAMP

	Major Account	1	Subs 2	3	Debit	Credit		Comment
Branch							Discount	

The following journal entry is typical of another form of source document.

JOURNAL ENTRIES

JOURNAL ENTRIES							DATE			
Dr.	Major Account	1	Sub 2	3	Reference	Debit	Credit	Volume	Disc	Comment

Master Information

That portion of master information that would provide the historic data for this system is referred to as the systems files.

A basic concept of this system is that a central or master file could be used to produce most of the accounting and management information required by most businesses. However, some information (for example: personnel records) could be handled more efficiently in a separate or secondary file.

Typical of the type of file that would constitute the heart of this system is the following exhibit. The user of this system would have the ability to specify this "Master File" when the system is first implemented. Once the record design has been decided upon, however, changes to its design would involve considerable effort or at least would require the services of trained programmers, so would constitute a portion of the "Support System". This then would be outside of the responsibility and ability of the system user. Changes to content within the pre-defined format could of course be performed by the system user. Care should be taken to allow for future contingencies by allowing extra unused fields and allowing plenty of space in all utilized fields. Changes would not be difficult for programmers if required, however.

As stated earlier, there should be little need for additional files if the master file records are designed to be used for many diverse tasks.

Although a complete master file might prove to be unwieldy for some unique applications, it is a relatively simple matter to break down the master file, using the selection routine, to create a smaller special purpose file in the same format as the master file. Standard programs or specially-written programs can then be used to operate on the condensed file.

Some auxiliary files that may be required and that might not lend themselves to the standard format are:

1. Personnel Files
2. Inventory Files

A sample personnel file record in a format different from the standard master file is shown here.

A sample inventory transaction record is shown next.

As will be shown later, the inventory master record would be much more extensive than the detail record used to update the master.

Although some applications might require the inventory record to be of a unique design, the standard input format for a company might be employed.

The systems user would not have to concern himself too much with how systems files such as those shown here were set up. He would be more concerned with understanding what the files

A TYPICAL MASTER FILE RECORD

Record Type	1	2	Branch Number	Major Acct. Num- ber	Sub 1	Sub 2	Sub 3	Sub 4	Department	Description	Comment	Statistical Figure	Volume 1	Volume 2	Current Dollars	Balance	Year to Date	Vacant
field length	1	2	6	6	4	4	4	4	4	35	35	10	8	8	10	12	12	46

The Fields Comprising a Master File Record

Field:	Explanation:
Record Type	To identify this as a Master File Record and specify what fields will be encountered
Branch Number	Useful for consolidated and branch reporting
Major Account Number	Most broad accounting distribution code (Note: Chart of Accounts Exhibit D)
Sub 1, 2, 3, 4	Few companies will break down their accounting entries to so fine a classification as suggested here but the provision of unused classifications allows for further sophistication
Department	This code could be included in one of the above sub-accounts. This field would be particularly useful for companies employing departmentalized accounting or cost centers.
Description	An alphabetic field of description can be included where required. Some companies may utilize this field only for major accounts while others may require a description at the finest level
Comment	A second alphabetic field might contain special comments about particular accounts or may be used as a second description

Statistical Figure	Although many comparative figures could be obtained from additional on-line files (eg. Y-T-D last year, same month last year) many companies will require budget figures or credit limit figures for comparative purposes
Volume Figure 1, 2	Figures such as vehicle mileage, barrels of oil, bushels, pounds, etc., will be required on some reports. Volume fields can be used for this purpose. A volume field on one record may contain pounds while another record may carry mileage without conflict.
Current Dollars	Amount currently being entered would appear here.
Balance	Dollar Balance may be a figure significantly different from year-to-date. Income items will be cleared yearly while the balance sheet items will be truly cumulative
Year to Date	May or may not coincide with balance
Vacant	Extra space should be allowed for future contingencies. Forward-thinking companies might allot specific fields for future use rather than a single vacant field. The more unused space available, the less effort needed to implement changes as needs change. The constraints on unused space would be storage space and processing time.

PERSONNEL FILE RECORD

Record Type	Branch	Employee Number	Name	Address	Physical Attributes	Education and Experience	Vacant
-------------	--------	-----------------	------	---------	---------------------	--------------------------	--------

INVENTORY TRANSACTION RECORD

Record Type	Branch	Major Account	Sub Numbers (would form part of I.D. of part)	Reference (Part Number)	Amount (Number Shipped or Received)	Vacant or Comment
-------------	--------	---------------	--	----------------------------	--	-------------------

contained, their format, and how to reference all files.

The same would hold true for a second aspect of master information, the system programs. The programs would be written by the programmers and would allow the users information to be processed. Here too, the user who is primarily operating-system oriented, would not need to know the details of individual system programs. He should, however, be familiar with the basic function of the programs. Appendix A gives a basic description of the programs that make up the heart of this management information system.

A third aspect of master information, The Report Specifications, are, however, very much the concern of the user. It is the ability of the user to specify and change the output, that makes this management information system unique and valuable to management.

Since this part of the system's input is the very heart of the system, considerable attention will now be given to The Report Specifications.

A sample Report Specification input sheet follows.

REPORT SPECIFICATIONS

REPORT NUMBER

DATE

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION

The Input Form

A form such as this would be used by any authorized person who required information from the system. Although extensive programs would be written by trained personnel to allow this system to function, all information that could be retrieved from this system would be reached through the specifications of this form.

Many aspects of any management information system would be needed repeatedly in much the same format every day, week or month. Needs do change, however, and this form will allow even the repetitive jobs to take on slight variations as needs change. Less repetitive or one-time jobs can be specified with this form in a very few moments by anyone familiar with its use.

The first part of the Report Specifications forms gives the title of the job, the report number, the date of the report (although this will automatically change as this job is repeated on other dates), and specifies whether an actual printed report will be produced or merely a "document" which will be processed further before a report is printed (or both).

The second part of the form sets out the detailed instructions for producing the desired output. "SEQ" or sequence allows each instruction to be sequenced so that operations are performed in the proper order. The MACRO column is where one-word instructions are coded. These MACROS are pre-defined to the system and have specific meaning to a particular system. The defining of the MACROS is one of the extensive jobs performed by the programmers that makes

it possible to produce required output without knowledge of programming and without consultation with computer specialists.

The next column DESIGNATION accepts further instructions pertaining to the data to be used in a particular job. DESCRIPTION accepts constant data such as the titles to appear on a report and the spacing of all constant and variable information.

Once the form is fully filled out, it will be processed by the card punch operators who will create one punch card for each line of instruction. These cards will then be merged with the appropriate control cards to be read into the system. They may immediately perform their job or they may remain in the system to produce a report or document at a later time.

The Language

The language to be learned by the user of this management information system consists of three main parts; the macros, the designations, and the descriptions.

The Macros

The word MACRO, in computing jargon, has come to mean a command which summons a number of actions or activities that will be performed whenever the macro itself is called forth. Here, the macros call the extensive routines that the programmers have programmed, into action to perform complex functions with a minimum of direction by the user. A more extensive dictionary of fifteen macros and their meanings appears in Appendix C but a few of the

most commonly used ones will be examined here to help explain the MACRO concept.

INPUT, for example, is used in the MACRO column of the instructions to indicate which files are to be used in a particular job. The user merely prints the word INPUT as the macro and follows it in the designation column by the names of the files that are needed. The macro INPUT will signal the computer programs to search out the needed files and make them ready to be processed according to instructions that follow.

INCLUDE, another macro, will usually be used in conjunction with INPUT to designate which records in the files are to be used. The INCLUDE macro might limit the records to be referenced on the files produced by INPUT to say, records numbered 100 to 1000 and 2500 to 3000, leaving those from zero to 99 and 1001 to 2499 untouched.

ORDER is another macro that is usually used with INPUT. ORDER specifies in what sequence records are to be processed. The ORDER command will cause those records selected by INCLUDE to be re-sequenced, if necessary, to the most convenient sequence for processing. ORDER will also insure that records on all files to be referenced will appear in the same order.

Now that the function of the macro has been examined, the next aspect of the language to be examined is the DESIGNATION column.

The Designations

Both the Designation column and the Description column indicate what data is to be processed by the macro instructions. The basic distinction between the two columns is that the Designation column deals with variables and Description deals with constants.

Very few symbols can be used in the designation column but there can be a great number of combinations of the symbols. The two most frequently used symbols are:

- F. - designating a file number (for example F.2 - file number two)
- K. - designating a field number (for example K.2)

It is the combination of these two symbols that allows the user to reference any field in any record in a file in the system, providing there are no security measures which prevent this. There is no symbol in this system that represents a record, only F. for file and K. for field number. The reason for this is two-fold. First of all, it would be extremely difficult for the user to determine which physical record in a file might contain the information that he requires. Secondly, there is no real need to refer to the entire record itself. By designating a field or a number of fields within the record as containing the key to selecting desired records, the records themselves can be chosen by simple reference to the key field.

Another group of designations is the arithmetic and logical symbols:

+
-
x
÷
>
<
=

Many management information systems would not require further arithmetic symbols, although some systems requiring a higher degree of technical information might employ square roots, derivatives and the like.

The single designation LINE _ is used to place heading information on the correct vertical position on a printed page or a display device. LINE_ is also used in conjunction with the description column to fix the horizontal spacing of heading information.

Two other designations that most systems will require are CONTINUE and GO TO. These designations are used in conjunction with logical comparisons to give directions for the sequence of processing.

Other designations could be added to this list once the programmers defined them to the system. Once so defined, the other designations could be used in the designation column.

The Descriptions

Contained in the description column is constant information required by the macro and designation columns to make their instructions complete. Constants to be used as headings are shown

here along with a number to indicate where the heading or portion of a heading is to appear on the specified output. Any word or group of words that is to appear on the output, is shown in quotation marks, and is followed by a comma and a number that indicates the horizontal position on the output to be occupied by the last letter in the quotation. All horizontal locations are specified as one of a possible 132 horizontal positions.

When the field designation (K.____) is used, the description column will often contain the key numbers that are to be used in a particular job. For example, a report specification may need to process all records containing the key numbers one to nine in field three of the record. The total instruction for this would be:

SEQ	Macro	Designation	Description
	Include	K.3	01-09

A single number in the description column may also refer to the horizontal output position of some variable specified in the designation column.

The last major group of information that might appear as description, is "tag information", meaning a word that is used to direct the program to another point in the processing cycle. If the word BEGIN appears in the description column, and is not contained in quotation marks, then the program will return to the

macro BEGIN and continue processing at that point.

A Sample Input

In order to show all aspects of the input forms together, a simple example of an input record and a report specification, are shown next. Assume we are dealing with file number one (F.1). We desire to print out the records from key number one to number nine in a legible fashion.

The Record

KEY NUMBER (K.1)	AMOUNT (K.2)
------------------------	-----------------

Report Specifications

SEQ	MACRO	DESIGNATION	DESCRIPTION
01	INPUT	F.1	
02	Include	K.1	01-09
03	Heading	Line 4	"Example", 090.
04	Format	F.1 K.1	020,
05		F.1 K.2	070,
06			
07			
08			
09			

The Output

Example	
01	100.00
02	50.00
03	150.00
04	20.00
05	75.00
06	100.00
07	50.00
08	150.00
09	20.00

Input Files

Before leaving the discussion of input to the management information system, it may be helpful to discuss the records and files that will provide the actual input that will be processed by the system. In a practical application, file design for this system would most likely be done as a joint effort of the user, with his knowledge of available information and desired output, and the programmer or systems analyst with his knowledge of the internal workings of the computer.

Once the files were established, changes in their structure could not be made easily as these changes could have far reaching effects on all jobs that make use of the files. The user may be required to set up new files, however; and he most certainly will have to be able to interpret what each file contains. A basic knowledge of records and files is therefore essential.

A file is made up of a collection of records of similar design. Each record falls in a particular position in the file according to a sequence number that each record contains. If records from one file are re-sequenced according to some other numbering scheme, a new file is in fact created.

In this management information system, a record will consist of three distinct parts.

1. Record Identification - including such things as record type, accounts numbers, department, branch.

2. Descriptive Section - fields that will not be involved in any type of arithmetic or logic operation including: statements, comments, statistical figures. The descriptive section of a record is not to be confused with Description on the Report Specifications.

3. Numerical Section - figures that could be involved in arithmetic or logical operations, for example, volume figures, budget amounts, credit limits, balance.

In any particular file, either the Descriptive Section or the Numerical Section might be blank (or missing entirely) but the Record Identification field must always be present.

Each management information system patterned after this design will have slightly different rules for file and record design. Different files within a single system too, could be different. All files, however, will be formulated according to a set of rules or specifications.

Following is a set of specifications for the records of a file of a management information system. Other specifications could be used as needs differ.

Design of Records for a Central File

1. Record I.D.

The first two digits will always be a record type code (numeric).

The remaining portion of the coding block will be the numbers that will be used for manipulating the records.

A table will identify each field by a "fixed dataname." That is, when each record is designed, the record I.D. section will

have a constant appearance and fields will have a constant set of datanames for that record file.

As seen earlier, each field will also be identified as K. ____.

Example:

	Record Type	Major Account	Sub 1	Sub 2	Dept.	Branch	Vacant
Length	2	4	2	2	2	2	2

This may be the coding block selected by one company. It would be a fixed length of 16 digits with one 2-digit field vacant for further use. (If this field is utilized in the future, it would likely be more convenient to rename it more appropriately.) Since computer tape and storage are relatively inexpensive, most companies would provide a much larger vacant section for further contingencies.

The six field names selected here would always be used when referring to the fields involved here unless the "K" designation was used.

A different order for the fields might be chosen. For example, a company that does much of its work on a decentralized basis might find it convenient to relocate "Branch" near the first of the coding block.

2. Descriptive Section

The Descriptive Section also could be of any length. Once a length was chosen, however, this length would become fixed, until extensive programming changes were made.

Any information that might later be displayed would reside here.

There would be no restriction on whether the contents of this section were alphabetic or numeric.

As in the coding block, each field within this section would take on a unique identification.

	Descrip 1	Descrip 2	Descrip 3	Descrip 4
Length	35	35	35	35

This example would be extremely flexible. In some cases, "Descrip1" would contain a name (of a supplier or customer) and the others would contain an address, while in other instances, these fields might contain other I.D. numbers (not used by this system) or comments.

The size chosen here (140 digits) would allow 4 large descriptive areas. Adjacent fields could make up even larger fields. Here too, in a practical application, ample room would be allotted for expansion or changes.

3. Numerical Section

This section would contain all those fields that might enter into any sort of calculation.

Because future uses of this system cannot be fully determined ahead of time in many instances, it would be wise to allow room for future expansion.

Example

Total This Month	Year-to- Date Total	Balance	Budget	Volume 1	Average	Volume 2
Length 12	12	12	12	12	12	12

Each of these 7 fields would be uniquely named (eg. Thismon, YTD, Balance, Budget, etc.) or would bear a "K" designation.

Some fields might contain different information in different records. The volume fields, for example, may contain pounds in some cases and mileage in others.

When these fields were defined, equations would be set up to show the relationship between the fields. For example, there would be a relationship between "Total" or "Thismon" (the current figure) and "YTD" and/or "Balance". This relationship would be defined when the system was initiated. Different or unusual manipulations of figures within these fields could be specified in a Report Specification, but the records themselves would not change.

Thereafter, when the file up-date took place, the appropriate figures would replace outdated figures in all affected fields.

Fields such as "Thismon", "Balance", and "Volume" would be affected by monthly transactions. "Budget", however, would likely be changed only with a special transaction record that would be reserved for changing constant data (like description fields).

When the various parts of this sample record are put together, the field identification (K.2, etc.) can be used. Each field can then be referred to by either its "dataname" or its "K" name. A more flexible system will employ the "K" names, although "K.7" may be less descriptive than "TOTAL". The use of both should satisfy most needs.

CHAPTER III

OUTPUT

In many of today's computing systems, management is indeed fortunate if it has a say in the design of its own reports. More commonly, management attempts to give the data processing people some idea of the information that they require, and the systems analysts take it from there. In more enlightened firms, management has learned that the art of report layout is an extremely easy one to learn and a most rewarding one to practice. Instead of depending on data processing personnel to develop useable formats, many executives have spent the time to design their own information reports.

Once even the enlightened managers have chosen their report designs, however, changes can be made only after serious consideration on the part of all parties involved. If accepted, the changes often involve a great deal of work by the programmers, and are not made quickly. Changes, it seems, are made only after more important programming jobs have all been completed.

In this management information system, not only are reports designed by the executive user or by his close aid, but the "programming" of the report by the use of the Report Specification forms, is also accomplished independent of the intervention of data processing personnel. As conditions change, the system user updates his Report Specifications to keep the reports he uses, as helpful as possible.

The use of Report Specifications has been touched on; now a look is taken at the reports themselves. Earlier in Chapter 1, a management information system was compared to a triangle built on a data base of accounting information. As an examination of the type of output that this system could produce, output used for each of the purposes outlined in the management information triangle are examined. The most detailed reports are used by accounting personnel. These reports make use of the great detail gathered at the data base.

Accounting Reports

Detailed Trial Balance or General Ledger

DETAILED TRIAL BALANCE								
January 1, 1971								
Page 1								
Branch	Major Account	Sub Account	Description	Reference	Current Vol.	Current Amt.	Y-T-D Vol.	Y-T-D Amt.
1	100	1	Cash	27321	10	10.00	100	100.00

The accountant's most detailed report would be a trial balance of all accounts or a general ledger. Because of its great detail, such a report would be quite useless to higher management.

Accounts Payable Ledger

ACCOUNTS PAYABLE

January 31, 1971

Page 1

Supplier Number	Name	Ref.	Date Payable	Discount	Gross	Net
10	Acme Supply	3451	Feb. 15	.05	100.00	95.00

Payroll Register

PAYROLL REGISTER

January 31, 1971

Page 1

Employee Number	Name	Gross Pay	Income Tax	Pension	Other Deductions	Net Pay	V-T-D Pay
--------------------	------	--------------	---------------	---------	---------------------	------------	--------------

Aged Trial Balance

ACCOUNTS RECEIVABLE

Aged Trial Balance

Page 1

Customer Number	Name	Current Amount	30-60	60-90	over 90
--------------------	------	-------------------	-------	-------	---------

From the basic information used in these reports, the accounting department can use the Report Specification form to produce other documents such as accounts receivable statements, payroll cheques and T-4 slips to give customers and employees information that they require from the system.

Reports at the Operating Level

Operating personnel will find some of their required information in the reports that the accounting department uses. The aged trial balance, for example, can be used to examine the pay habits of customers. They may, however, request less detailed information such as a listing of all customers with accounts over 90 days. The information is readily available in the system and could be condensed very easily by the system if so instructed with a Report Specification.

Operating personnel in other departments would require information on other phases of the business.

Purchasing Department

STOCK STATUS EXCEPTION REPORT

January 1, 1971

Page 1

Part	Number	Description	EOQ	On Hand	Lead Requirements
------	--------	-------------	-----	---------	-------------------

Marketing Department

SALES ANALYSIS REPORT

(By Salesman)

January 31, 1971

Page 1

Salesman	Branch	Customer	Sales
1	10	1	5,000
.	.	.	.
.	.	.	.

Top Management Reports

It is doubtful if top management would require a complete Stock Status Exception Report on a regular basis but the monthly sales analysis of company salesmen might interest even the company president. Top management would be interested in the ability to make special requests of the system. Just prior to a branch manager's meeting, for example, the president might request a summary report showing sales by branch of the total company.

BRANCH SALES SUMMARY

December 31, 1970

Page 1

Branch Number	Branch Name	Sales
1	Toronto	100,000
2	Winnipeg	25,000
3	Edmonton	50,000
4	Vancouver	75,000

The company president might also want to see the unaudited balance sheet and income statement of the company as soon as the accountants have balanced their books for the year and have run a trial balance. He would merely ask for a less detailed print out of the accounts of the company in two Report Specifications called Balance Sheet and Income Statement.

Other Output Media

Modern computer technology has developed numerous methods of displaying the output of a computer system. After printed output, the most desired form for information to take is a picture on a display device. At the top management level especially, the use of remote television displays can greatly expand the usefulness of a management information system. To summon information in a form that has been catalogued, the company president would merely have to type in a code and the information would be displayed in front of him on his desk remote terminal. Information that had not been requested before could be called by typing in the Report Specifications to define what was required.

Less romantic perhaps, but also effective, would be a remote printing terminal which would print out required information on a typewriter terminal in the president's office.

Other devices such as card punches, paper tape punches, plotters, and tape units could record information that would be processed by some other system or at a different location.

CHAPTER IV

THE SYSTEM IN USE

The concept of this management information system has been outlined, and the basics of how the system works, have been examined. Now we are able to proceed with using this system to produce information for a company.

The method to be used to show this management information system in action, will be to show the files of the company, the Report Specifications set out by the company, and the information produced for the company. The management information system shown here is a basic system. More specialized information may be requested later by the company, and more unique methods may be used for display.

Background Companies

The information requirements of two companies were studied in depth in preparing this paper. One company, a Calgary-based oil company, had highly specialized requirements and demanded extensive reports to provide the U. S. parent company with information about the Canadian operation. Because of the secret nature of much of the activities of oil companies, it has been requested that the company name not be revealed. In 1969, the company had expanded manual accounting operations to a point where the addition of more personnel and more paperwork simply would not solve the burgeoning information requirements of the company. Management began to look

to computers as a possible answer to their needs. It soon became evident, however, that the many diverse systems in use at that time did not lend themselves to a single computer system. Like many complex companies today this company needed a system that would be customized to their needs and yet could be modified as their understanding of their needs became clearer and these needs changed. It was at this point that I began the project that is presented here. The cost of obtaining information within this company was not of primary importance. Time, however, was one very important factor. Management information had to be produced quickly according to strict deadlines. The ability to change was the second important consideration of the oil company in its information requirements. The parent company frequently discarded information reports and requested different information. The Province of Alberta Oil and Gas Conservation Board also changed their information requirements for the company frequently, and with little consideration of the impact of such changes on the information system of the oil company. Noteworthy of this first company, then, is the fact that their information system had to produce highly specialized reports, they had to be produced quickly, and frequent changes had to be handled easily.

The management information system outlined in this paper would satisfy the requirements of the oil company extremely well. Today, in fact, a computer system is in operation there, that was designed around the prototype of this management information system.

Because the requirements of the oil company were highly

specialized, I felt it necessary to test this system on a company with entirely different requirements. A second company, a wholesale distributor of industrial and home products, was used for the other in-depth study. A combination system of manually-produced information and computer-produced information was not too satisfactory. A great deal of effort was required to prepare computer input and the output was not totally satisfactory. Since the computer programs were written and processed by a data centre, there was poor understanding of their purpose, and needed changes were too costly to implement. There was a critical need for an understandable system that could be refined and expanded upon. The information required by the distribution company generally lacked any complexity. The needed data was readily available but the best design of the output was uncertain at that time. Management was not sure what form their reports should take. The suggestion was made that the reports presently being produced by the data centre, if modified slightly, would provide a good basic information system for the company. The work required to set up the input data would have to be reduced if the system were to operate economically.

A data centre produced some of the information requirements:

- Profit and Loss Statement
- Statement of Operating Expenses
- Aged Trial Balance
- Purchase Listing by Branch
- Sales Analysis by Salesman

The reports themselves were little more than a listing of the input prepared by the branch personnel. The sample company used in this chapter will employ the management information system to produce reports that would replace existing reports used by this distribution company as well as additional reports that would be produced by the same system.

Of the two companies studied, the oil company's needs were the most complex. The distributing company's requirements, on the other hand more closely approximated a "typical" company in any industry. The system presented here can handle the complexity of the oil company, yet is universal enough to provide information needed by companies in diversified fields.

With full knowledge that any company that was presented as a "typical company", would show some typical traits, the following company outline is presented for a company to which the management information system will be applied.

The Sample Company

The sample company is a distribution company with five branch offices as well as a head office. It is an expanding company and has set up a numerical chart of accounts in anticipation of some day computerizing its information system. There are no trained data processing personnel in the company although management is vaguely familiar with the types of functions performed by computers. Since the company is expanding and future information needs are not

presently known, a flexible system is needed. Because of the absence of trained data processing personnel within the company, the information system will have to be set up by outsiders. The preparation of input should be as simple as possible and accounting and present record-keeping forms should be kept unchanged where possible.

The accounting and finance departments require a system to produce their needed information in readable form with a minimum of effort and change within their departments. The marketing department requires a better analysis of sales and more extensive breakdown of sales than is produced manually. Management requires tighter control of all aspects of business and is particularly interested in inventory control.

A Sample System

Information Files

Three main files comprise the basic management information system for the distribution company.

1. Main accounting file
2. Payroll file
3. Inventory control file

1. Main Accounting File:

The main accounting file consists of a sequential group of master account records (record type 1). In order to maintain the master records, two other record types must also be designed.

RECORD TYPE 1 MAIN ACCOUNTING RECORD (F.1)

Field Length	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Record Type 1	Branch No.	Major Account	Sub 1	Sub 2	Sub 3	Department	Description 1	Description 2	Description 3	Statistical Figure	Volume	Balance	Year to Date	Vacant
	2	2	5	2	2	2	2	35	35	35	7	7	9	9	40
K. _	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Type 2 is an accounting transaction record that would be used in the daily, weekly, or monthly updating of the master accounting file.

Type 3 is a change record that would be used to add or delete master records, or make some change that could not be considered a normal transaction.

a. Record Identification

Fields K.1 to K.7 form the record identification of the main accounting record. Allowance has been made to departmentalize information and to isolate information about various branches. If management should require a balance sheet and income statement for one of their branches, say branch one, instructions on the Report Specifications need only limit the processing to all type 1 records containing 01 in field two (K.2).

The balance of the record identification is made up of the accounting code of a particular record. Initially, the distribution company may choose to not break down accounts to all three sub-accounts, or they may choose to show a fine break down for only a few accounts.

b. Descriptive Section

Fields eight to ten (and possibly eleven) form the descriptive section of the main accounting record. Any information that might be required at some time, yet which need not be altered by a transaction, appears here.

As an example of the descriptive information that these fields might contain, assume our company operates with the chart of

accounts shown in Appendix B. If the record in question was an accounts receivable record, and we were interested in the account of customer 05, the record would appear as follows:

Record Type	01
Branch	01
Major Account	101 (Accounts Receivable)
Sub 1	01 (from customers, partners, employees)
Sub 2	01 (receivable from customers)
Sub 3	05 (customer number 5)
Description 1	Armet Consulting Company
Description 2	10236 - 98 Avenue
Description 3	Edmonton, Alberta

c. Numerical Section

Figures that might be altered by an accounting transaction record (fields 12, 13, 14 and possibly 11) form the numerical section of the main accounting record. Figures contained in these fields would pertain to the account identified in the record identification. They might be manipulated by the instructions of a Report Specification, but could be changed on the record itself only by the action of a transaction record containing the same record identification.

RECORD TYPE 2 ACCOUNTING TRANSACTION RECORD (F.2)

Record Type 2	Branch No.	Major Account	Sub 1	Sub 2	Sub 3	Department	Vacant	Reference	Volume	Current	Date	Salesman
2	2	5	2	2	2	2	34	5.	8	7	6	3

K.1	2	3	4	5	6	7	8	9	10	11	12	13
-----	---	---	---	---	---	---	---	---	----	----	----	----

The record identification of the account transaction records must coincide exactly with those of the main accounting record. Each time a transaction record is matched with a main or master record, the numerical fields of the master will be updated by the amounts shown in the appropriate section of the transaction.

The descriptive section would be absent from the transaction record as the record can not be used to alter descriptive fields. The numerical section, however, will provide figures to be added to, or subtracted from, their counterparts in the master record.

RECORD TYPE 3 ACCOUNTING CHANGE RECORD (F.3)

Type 3	Branch	Major Account	Sub 1	Sub 2	Sub 3	Depart.	Descr 1	Descr 2	Descr 3	Statistical Figure	Vacant	
K	1	2	3	4	5	6	7	8	9	10	11	12

The distinction between the transaction and the change records has been mentioned but can be summarized as the transaction record updates the master; the change card changes it. The record identification again is the same as the other types. The numerical fields do not appear in the change record; description does. If records are to be added or deleted, it is the change record that performs this act.

Both the transaction record and the change record could include all fields contained in the main accounting record.

a. Record Identification

The record identification here consists of only three fields (K.1, K.2, K.3). It is clear from this that the payroll file as it now exists can never be processed directly with the main accounting file. This convention is adopted here but the payroll records could form a part of the main accounting file. By retaining the same record identification as the main accounting record, the payroll records could fall into the main accounting file.

Referring again to the sample chart of accounts in Appendix B, the payroll record for employee number 121 could exist in the main accounting file and be identified as follows:

Record type	04
Branch	01 (or other branch)
Major Account	350 (production expense)
Sub 1	01 (company labor)
Sub 2	121 (employee number)

The balance of the information shown in our sample payroll master record could follow next. The only limitations would be that the total record length be equal to those of the other main accounting records and that care be taken in the processing to see that account transaction records were not used to update the payroll records.

The convention chosen in the sample payroll master has the disadvantage of creating a wholly new file type, but has the advantage of eliminating possible errors caused by accounting transactions being used to update payroll records.

b. Descriptive Section

If the payroll master is not used as the personnel file, the descriptive section (K.3, K.4, K.5, K.6, K.7) is similar to that of the main accounting record. If additional personnel information were added in the vacant space provided, however, the descriptive section would be much more extensive.

c. Numerical Section

The numerical section of the payroll master record would be extremely large if it were to allow for all the possible deductions and combinations of wage payments that could be possible.

The numerical section set up here would allow a great deal of information pertaining to labor costs to be determined. The preparation of yearly T-4 slips would be an easy task with all this information available.

RECORD TYPE 5 PAYROLL TRANSACTIONS (F.5)

Type 5	Branch	Employ #	Reg Hr	OT Hr	OTH Dec
K.1	2	3	4	5	6

Because the payroll master is so extensive, the payroll transaction record can be kept extremely simple. Only regular and overtime hours worked would have to be recorded along with unusual deductions that are not handled in a standard way.

RECORD TYPE 6 PAYROLL CHANGES (F.6)

Type 6	Branch	Employ #	Name	Street	City	Reg Rate	OT Rate	UIC Ded	CPP Ded	In Tax Rate
K.1	2	3	4	5	6	7	8	9	10	11

Because the payroll master record contains such a large amount of constant data, the change record must also be extensive. As well as changes in name and address, rates of pay and deductions could also occur and would have to be implemented with the change record.

3. Inventory Control File:

The third file to be used by the distribution company is the inventory control file. Again by appropriate coding this file could be resident with the main accounting file, but there would be little advantage to this. A merger of these two files would make the accounting file unwieldy.

RECORD TYPE 7 INVENTORY MASTER RECORD (F.7)

7	System Coding No.	Part No	Description	EOQ	Lead Time Sup	Qty on Hand	Price	Cost
K.1	2	3	4	5	6	7	8	9

The record identification would be made up of the record type number (7), a system coding number, and a part number. In some industries, the part number might also be used as the system coding number but in distributing, there are many different systems of part numbers that have to be used. By adding a system coding number, all parts can be included in one numbering system. A cross reference chart would show the relationship between the manufacturer's part number and the coding number.

The descriptive section would contain the name of the part, the economic order quantity, number of parts needed to fill orders during the lead time, the price of the part and its cost. The numerical section would consist of the single field, quantity on hand.

RECORD TYPE 8 INVENTORY TRANSACTION (F.8)

8	Coding No	Part No	Un- its
---	--------------	------------	------------

Only quantities sold or received would be recorded with the transaction record.

RECORD TYPE 9 INVENTORY CHANGES (F.9)

9	Coding No	Part No	Description	EOQ	Needed Supp	Price	Cost
---	--------------	------------	-------------	-----	-------------	-------	------

Changes to cost figures and retail selling price would be made with the change record. As more sophisticated methods of computing economic order quantity are employed, the EOQ field can also be changed using this record.

Having looked at the main files used in a distribution company's information system, attention is now given to the output of the management information system and the specifications used to obtain the output.

Specifications and Output

The following instructions refer to the files just outlined, and show the information that the user would have to give in order to produce each report using the management information system.

REPORT SPECIFICATIONS DETAILED G/L TRIAL BALANCE

REPORT NUMBER 01

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
010	INPUT	F.1, F.2	
020	INCLUDE	K.2	1-4
030		K.3	100-800
040		K.4	000-999
050		K.5	000-999
060	ORDER	K.2	
070		K.3	
080		K.4	
090		K.5	
100	TOTAL	K.3	
110		K.2	
120	SUMMAR	K.5	
130	CALC	F.2K.10 +	
		F.1 K.12	
140		F.2 K.11 +	
		F.1 K.13	
150		F.2 K.11 +	
		F.1 K.14	
160	HEADING	LINE 1	'DETAILED G/L TRIAL BALANCE', 080
170	DATE	LINE 2	72
180	PAGE	LINE 2	130
190	HEADING	LINE 4	'BRANCH', 007, 'MAJOR', 016, 'SUB 1', 024,
200		LINE 4	'SUB 2', 031, 'SUB 3', 040, 'DESCRIPTIO N', 060,
210		LINE 4	'REF.', 075, 'CURRENT', 100, 'Y-T-D', 128
220		LINE 5	'VOL.', 83, 'AMT', 099, 'VOL.', 120
230		LINE 5	'AMT', 132
240	FORMAT	F.1 K.2	004
250		F.1 K.3	014
260		F.1 K.4	022
270		F.1 K.5	029

REPORT SPECIFICATIONS DETAILED G/L TRIAL BALANCE

REPORT NUMBER 01

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
280		F.1 K.6	038
290		F.1 K.8	065
300		F.2 K.9	075
310		F.2 K.10	083
320		F.2 K.11	105
330		F.1 K.12	114
340		F.1 K.14	132

THE OUTPUT OF REPORT SPECIFICATION 01
 DETAILED G/L TRIAL BALANCE

January 1, 1971

Page 1

Branch	Major	Sub 1	Sub 2	Sub 3	Description	Ref.	Current		Y-T-D	
							Vol.	Amt.	Vol.	Amt.
1	100	01			Deposit Account	27321		1,100.00		1,100.00
1	100	02			Expense Account	73911		1,150.00		1,150.00
1	100	03			Petty Cash	5922		500.00		500.00
					Total			2,750.00		2,750.00
1	101	01			Accounts Receivable	11911		2,200.00		2,200.00
1	101	01	01		Customers			2,000.00		2,000.00
1	101	01	02		Partners			100.00		100.00
1	101	01	03		Employees			100.00		100.00
					Total			4,400.00		4,400.00

REPORT SPECIFICATIONS TRIAL BALANCE SUMMARY

REPORT NUMBER 02

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
010	INPUT	F.1	
020	INCLUDE	K.2	1-4
030		K.3	100-800
040		K.4	000-999
050		K.5	000-999
060	ORDER	K.2	
070		K.3	
080	TOTAL	K.2	
090	SUMMAR	K.3	
100	CALC	F.2 K.10 + F.1 K.12	
110			
120		F.2 K.11 + F.1 K.14	
130	HEADING	LINE 1	'TRIAL BALANCE SUMMARY', 078
140	DATE	LINE 2	070
150	PAGE	LINE 2	130
160	HEADING	LINE 4	'BRANCH', 020, 'MAJOR', 040
170		LINE 4	'CURRENT,' 075, 'Y-T-D', 100
180		LINE 5	'VOLUME', 065, 'AMOUNT', 082
190			'VOLUME', 096, 'AMOUNT', 125
200	FORMAT	F.1 K.2	018
210		F.1 K.3	038
220		F.2 K.10	063
230		F.2 K.11	080
240		F.1 K.12	094
250		F.1 K.14	123

TRIAL BALANCE SUMMARY

January 1, 1971

Branch	Major	Current		Y-T-D	
		Volume	Amount	Volume	Amount
1	100		2750.00		2750.00
1	101		2200.00		2200.00

REPORT SPECIFICATIONS ACCOUNTS RECEIVABLE REGISTER

REPORT NUMBER 03

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
010	INPUT	F.1, F.2	
020	INCLUDE	K.2	1-4
030		K.3	100
040		K.4	020
050		K.5	000-999
060	ORDER	K.3	
070		K.2	
080		K.4	
090		K.5	
100	TOTAL	K.5	
110		K.2	
120	SUMMAR	K.5	
130	CALC	F.2 K.10 + F.1 K.12	
140		F.2 K.11 + F.1 K.13	
150	HEADING	LINE 1	"ACCOUNTS RECEIVABLE REGISTER", 080
160	DATE	LINE 2	072
170	PAGE	LINE 2	130
180	HEADING	LINE 4	"CUSTOMER", 020, "NAME:", 040,
190		LINE 4	"DATE", 075, "SALESMAN", 085,
200		LINE 4	"REF:", 092, "AMOUNT", 125.
210	FORMAT	K.5	017
220		F.1 K.8	060
230		F.2 K.12	078
240		F.2 K.13	083
250		F.2 K.9	095
260		F.1 K.13	
	OR	F.2 K.11	125

ACCOUNTS RECEIVABLE REGISTER

January 1, 1971

Page 1

Customer	Name	Date	Salesman	Ref	Amount
001	Acme Moving and Storage		01		100.00
001	Acme Moving and Storage	12/8/68	01	26375	5.00

REPORT SPECIFICATIONS A/R STATEMENTS

REPORT NUMBER 04

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
010	INPUT	F.1, F.2	
020	INCLUDE	K.2	1-4
030		K.3	100
040		K.4	020
050		K.5	000-999
060	ORDER	K.5	
070	TOTAL	K.5	
080	CALC	F.2 K.10 +	
090		F.1 K.12	
100		F.2 K.11 +	
105		F.1 K.13	
110	HEADING	LINE 1	F.1 K.8, 065
120	DATE	LINE 1	120
130	HEADING	LINE 2	F.1 K.9, 065
140		LINE 3	F.1 K.10, 065
150		F.2 K.12	009
160	FORMAT	F.2 K.9	020
170		F.2 K.13	040
180		F.1 K.12 OR	
190		F.2 K.10	100
200		F.1 K.13 OR	
210		F.2 K.11	115

STATEMENT # 0001					
SOLD TO Acme Moving and Storage 409 Bentall Building Edmonton, Alberta					January 1, 1971
DATE	INVOICE	SALESMAN	ACCOUNT	VOLUME	AMOUNT
				1000	100.00
12/8/70	26375	01	001	50	5.00
12/8/70	97376	01	001	200	20.00
12/17/70	99312	01	001	1000	100.00
12/20/70	2319				100.00 CR
				TOTAL	125.00

Reports such as accounts receivable statements can be produced on preprinted forms.

REPORT SPECIFICATIONS SALES ANALYSIS (BY SALESMAN)

REPORT NUMBER 05

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
010	INPUT	F.1, F.2	
020	INCLUDE	K.2	1-4
030		K.3	100
040		K.4	020
050		K.5	000-999
060	ORDER	K.2	
070		K.13	
080		K.4	
090	TOTAL	K.2	
100		K.3	
110		K.4	
120	SUMMAR	K.5	
130	CALC	F.2 K.11 + F.1 K.13	
140	HEADING	LINE 1	"SALES ANALYSIS:", 050
150		LINE]	"BY SALESMAN", 049
160	DATE	LINE 3	050
170	PAGE	LINE 3	075
180	HEADING	LINE 5	"SALESMAN", 010
190		LINE 5	"BRANCH", 020
200		LINE 5	"CUSTOMER", 050
210		LINE 5	"AMOUNT", 072
220			

SALES ANALYSIS
BY SALESMAN

January 1, 1971

Page 01

Salesman	Branch	Customer	Amount
01	01	001	100.00
01	01	002	50.00
01	01	003	50.00
			200.00*
02	01	004	50.00

Note: This Sales Analysis Report could be produced without keeping Line Items from invoices. If Line Items were retained (for inventory purposes) a much more extensive sales analysis by product or product within salesman could be done.

REPORT SPECIFICATIONS PAYROLL REGISTER

REPORT NUMBER 10

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
010	INPUT	F.4, F.5	
020	INCLUDE	K.2	1-4
030		K.3	000-999
040	ORDER	K.2	
050		K.3	
060	TOTAL	K.2	
070	SUMMAR	K.3	
080	CALC	F.5 K.4 x	
090		F.4 K.7 =	
100		F.4 K.9	
110		F.5 K.5 x	
120		F.4 K.8 =	
130		F.4 K.10	
140		F.4 K.9 +	
150		F.4 K.10 =	
160		F.4 K.11	
170		F.4 K.11 +	
180		F.4 K.21 =	
190		F.4 K.21	
200		F.4 K.12 +	
210		F.4 K.13 =	
220		F.4 K.13	
230	IF	F.4 K.15 =	
240		85.00,	
250	OR	F.4 K. 15	
260		85.00,	
270	THEN	F.4 K.14 = 0	
280	ELSE	F.4 K.14 =	
290		F.4 K.14	
300		F.4 K.12 +	
310		F.4 K.13 =	
320		F.4 K.13	

REPORT SPECIFICATIONS

PAYROLL REGISTER

REPORT NUMBER 10

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
330		F.5 K.6 +	
340		F.4 K.16 =	
350		F.4 K.17	
360		F.4 K.11 x	
370		F.4 K.18 =	
380		F.4 K.19	
390		F.4 K.19 +	
400		F.4 K.20 =	
410		F.4 K.20	
420		F.4 K.11 -	
430		(F.4 K.12 +	
440		F.4 K.14 +	
450		F.5 K.6 +	
460		F.4 K.19)=	
470		F.4 K.22	
480		F.4 K.22 +	
490		F.4 K.23 =	
500		F.4 K.23	
510	HEADING	LINE 1	"PAYROLL REGISTER", 070
520	DATE	LINE 2	068
530	PAGE	LINE 2	132
540	HEADING	LINE 4	"EMPLOYEE",015, "NAME", 030,
550		LINE 4	"RATE",040
560		LINE 4	"CURRENT", 070,
570		LINE 4	"Y-T-D_", 120
580		LINE 5	"REG. O.T.",045
590		LINE 5	"GROSS UIC I. T. DED", 068
600		LINE 5	"AMOUNT GROSS UIC", 110,
610		LINE 5	"I.T. DED", 122,
620		LINE 5	"AMOUNT", 132
630	FORMAT	F.4 K.3	015
640		F.4 K.4	030

REPORT SPECIFICATIONS PAYROLL REGISTER

REPORT NUMBER

10

DATE January 1, 1971

REPORT

AND/OR DOCUMENT

SEQ	MACRO	DESIGNATION	DESCRIPTION
650		F.4 K.7	038
660		F.4 K.8	045
670		F.4 K.11	050
680		F.4 K.12	055
690		F.4 K.19	062
700		F.4 K.22	090
710		F.4 K.21	100
720		F.4 K.13	110
730		F.4 K.20	116
740		F.4 K.23	132

PAYROLL REGISTER

January 1, 1971

Page 01

Employee	Name	Rate		Current			Y-T-D				
		Reg.	O.T.	Gross	UIC	I.T. Ded	Amount	Gross	UIC	I.T. Ded	Amount
0072	James Farmer	2.40	3.60	192.00	4.80	36.00	151.20	192.00	4.80	36.00	151.20
0073	Bill Johnson	2.40	3.60	192.00	4.80	36.00	151.20	192.00	4.80	36.00	151.20
0074	Mike Thomas	2.40	3.60	192.00	4.80	36.00	151.20	192.00	4.80	36.00	151.20
0075	Bill Reid	2.40	3.60	192.00	4.80	36.00	151.20	192.00	4.80	36.00	151.20
0081	Bob Smith	2.40	3.60	192.00	4.80	36.00	151.20	192.00	4.80	36.00	151.20

Expansion of the System

Continuing with the sample distribution company, expansion possibilities for a basic management information system can be examined.

The easiest area in which to expand the system is to produce more reports than presently produced by the basic system. The accounting department might decide to produce monthly income statements and balance sheets using the system, or an accounts payable register might be added. The marketing department might decide to view sales by other categories than just salesmen.

The next level of sophistication for this system would involve the use of some sort of inquiry. An inquiry would differ from a report in that the inquiry would be a special request for information not normally requested, or a request for information in a format different from what is usually requested.

Top management would be particularly interested in this feature of the system since it would allow quick answers to questions posed by the manager. Inquiry in its simplest form would involve the same procedure as for reports except the processing would follow immediately after the information request. A more sophisticated form of inquiry would involve the use of some sort of remote terminal to make the information request.

A typewriter terminal could be used to type in the report specifications for an inquiry or it could be used to call

forth previously catalogued report specifications that would answer the inquiry.

A more recent development, the cathode ray tube console (CRTC) allows inquiries to be keyed in on a console and the answer to the inquiry displayed on a television tube,

CHAPTER V

CONCLUSION

The information system presented here is a concept or outline. It is not a set of constraints which will apply to some companies and not to others. It is adaptable to a wide range of companies' information requirements.

It is hoped that at this stage, the reader is convinced that management information systems are a needed development for today's companies and that this management information system is workable and useful. If the reader is in agreement with the utility of this management information system, it may be helpful to conclude this paper with some direction for management to take to begin the implementation of this management information system.

In 1958, Adrian McDonough observed: "Half the cost of running our economy is the cost of information. No other field offers such concentrated room for improvement as does information analysis."¹ Still, however, many managers seem content to delegate the development of their information systems to technical specialists. Any manager accepting the direction of this paper will become involved.

Before looking at a four-point outline that could be

¹"Today's Office-Room for Improvement," Dun's Review and Modern Industry, September, 1958, p. 50.

followed by management in developing an effective management information system, it is wise that management first take a broader view of their information plan.

Several years ago, Marshall K. Evans and Lou R. Hague presented a "Master Plan" for information systems that is still valid today.² They caution management against becoming involved in detailed information plans prior to examining (a) the long-range plans of the corporation and (b) the present information system. Short-run changes in procedure, consistent with the overall company plans, can often be suggested by an examination of the present system. Also prior to detailed development work, Evans and Hague suggest assigning time schedules and fixing responsibility for all aspects of the project. Clearly, these are not tasks to be assumed by anyone but management personnel.

Having thus been cautioned to keep information planning within broad corporate plans, the manager might proceed by following this outline:

A Manager's Guide
to Developing an M.I.S.³

1. Ready the organization:

The organization of all departments must be examined

²Marshall K. Evans and Lou R. Hague, "Master Plan For Information Systems", Harvard Business Review, January-February 1962, pp. 92-103.

³John Dearden, "How to Organize Information Systems," Harvard Business Review, March-April, 1965, pp. 65-73.

and all responsibility clearly defined. The efforts of various groups such as management, new product groups, market research personnel, control and finance departments, systems analysts, and programmers must be co-ordinated. Responsibility for the design and development of each stage of the management information system must be decided. Many approaches are available for fixing responsibility. They range from a complete reorganization of the organization (perhaps the ideal solution but often impractical), to retaining present departments and adding a co-ordinator who will co-ordinate the activities of the various departments and the systems people. Under this latter system, all departments within the organization would have to have similar co-ordinators.

2. Choose a level of sophistication:

As a general rule, it is usually best to implement a well-designed basic system as the system users become more sophisticated in their use of it. M.I.S. makes use of such concepts as decision theory, model building, simulation, and management by exception. Decision theory is a term used to describe a collection of techniques for logically weighing out the factors in a problem and assigning numerical values to them. Model building and simulation are techniques of decision theory. Management by exception is a system of identification and communication that signals the manager when his attention is needed, and remains silent when his

attention is not required.⁴ These devices, all very essential elements of scientific management, can be added once a basic modular system such as the one outlined in this paper is operational.

3. Determine major techniques to be used:

The nature of the data bank, the type of data display and presentation, and the selection of the computer hardware or data centre are all important considerations that should not be overlooked by management. In this area, technical specialists can be extremely useful but they should not dictate these items. A common mistake here is to select these rather mechanical aspects of the system prior to clarifying exactly what the system is to accomplish. The result of this approach is fitting the management information system not to company requirements, but to the computer hardware.

4. Operate within budgetary constraints:

All the aspirations of management for a suitable management information system must be tempered by the limitations of the budget. An immediate reaction by some might be: Why not apply the principles presented here to a manual system and eliminate the need for a computer entirely? It is true that many of these principles could be applied to improve manual systems, but a computer-based management information system will always be superior for two

⁴For a lively discussion of the jargon of M.I.S. see: William R. Kelly, "Don't Let Those Smartmouth MBA's Cow You," Marketing/Communications, September, 1968, pp. 48-60.

reasons: (1) speed, and (2) capacity. Seldom is it economically feasible to meet the objectives of a management information system by manual means.

Alfred Hawkins, Vice-President of North American Rockwell Corporation, in a speech to a marketing conference in New York, told his listeners: "Don't resist computers - your competition won't."⁵ He went on to advise personnel to become more knowledgeable about computers and application in their area of interest and to take a more realistic view of what can be accomplished now by utilizing existing techniques.

Management information systems definitely have their place in present day organizations. Properly conceived and implemented, they can aid better decision making, reduce inventory, expand sales analysis and make sales forecasting more accurate. The prime ingredient of a successful management information system, is management involvement. Without it, most management information systems will be unsatisfactory.

Contrary to much that we read, most companies are just now planning and implementing their information systems. Some companies are still awaiting some grandiose system that will solve all of their information needs, but most now realize that we now have the technology to implement useful systems. Implementation of basic modular systems, like the one proposed in this paper, appears to be the best way to solve fully sophisticated systems in the end. No longer is M.I.S. a thing of the future.

⁵Alfred Hawkins, Marketing, October 25, 1968.

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APPENDIX A

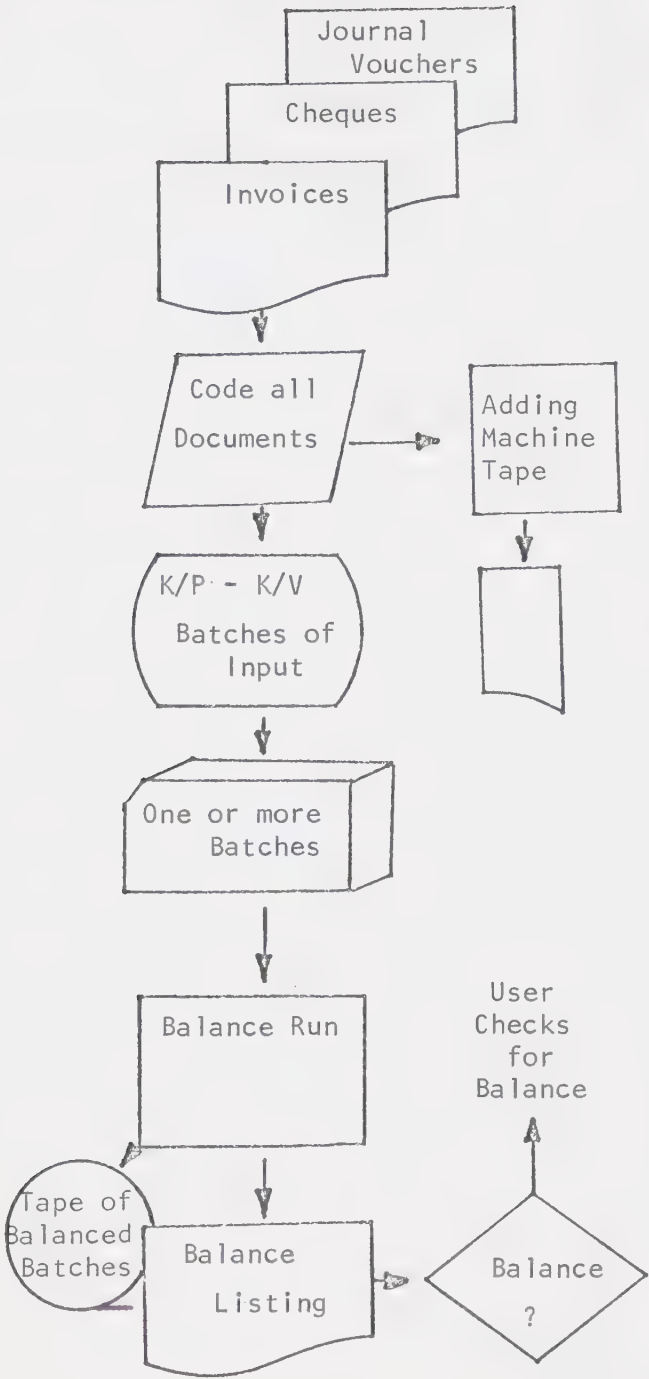
SYSTEM PROGRAM

Five basic programs make up the heart of this system. For any given operation one or more of these programs will be used. As an example, if the system was fully updated and a top management official wanted to make an inquiry, the first three programs, The Balance Run, sort to Master Sequence, and The Master File Update, would not be used.

Program No. 1. Balance Run:

Whenever batch processing is used to update the central file, all input must be balanced. Each batch submitted must have an adding machine tape of all entries in that batch (or when line items are to be keypunched, one page's total will be one adding machine entry). The program will sum all dollar amounts, and hash totals if requested, and attempt to zero balance to a total record which will contain the adding machine-tape total.

DIAGRAM A



Program No. 2. Sort to Master Sequence:

Whereas Program No. 1 Balance Run would be run as often as convenient to condense input records into a neater medium such as magnetic tape, the Sort to Master Sequence program would be performed only once prior to the actual updating of the system. If records were to form more than one file for some reason, there might be additional sorts performed at this stage also.

The frequency of use of the Sort program would depend on the level of sophistication of the Management Information System. The simplest system might require this run only once a month, whereas more complex systems might make this a daily operation.

For many companies, the most logical sequence of the master file will be the same order as the chart of accounts. That is, Balance Sheet items, would be followed by Income Statement items in the order that they would appear in these two reports.

When this is the sequence, and is as straightforward as this, a sort utility will perform the task of this program.

When the master file sequenced is unique, a more complex program perhaps employing a Table Lookup for sequencing will be employed.

DIAGRAM B



When all batches for the processing period have been received they are sorted to master file sequence.

Program No. 3. Master File Update:

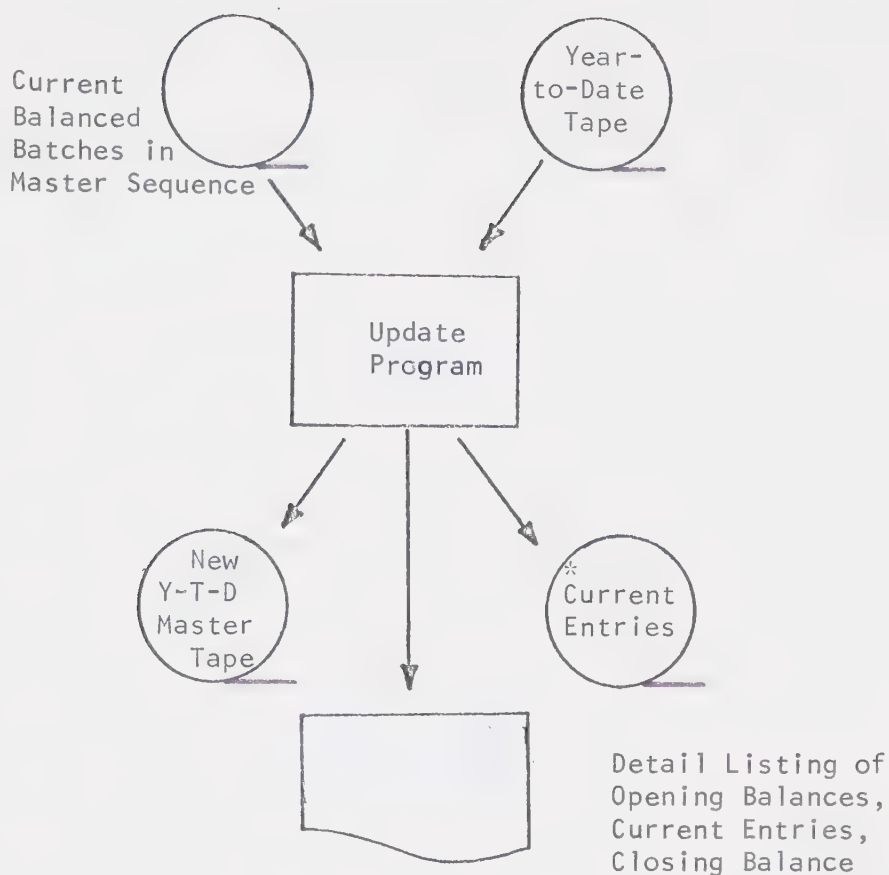
This program would consist of a fairly straightforward file update with the year-to-date master being updated with all current entries.

A major deviation from a standard file update would be that certain flagged accounts might be kept on an open item basis. In order to maintain the detail of current updating entries, the usual balance forward form of records might be expanded to show all entries to an account on an individual basis. These accounts would have to be treated in a special manner. Accounts Receivable and Payable might be dealt with in this way.

A by-product of this update, a detail list of opening entries and closing balances could be used as a Trial Balance. If aging is required, a document drawn off at this time could serve as input to a later program where an aging subroutine could be employed.

Current entries would also provide input to Program No. 4 where only current figures might be needed (eg. Accounts Payable).

DIAGRAM C



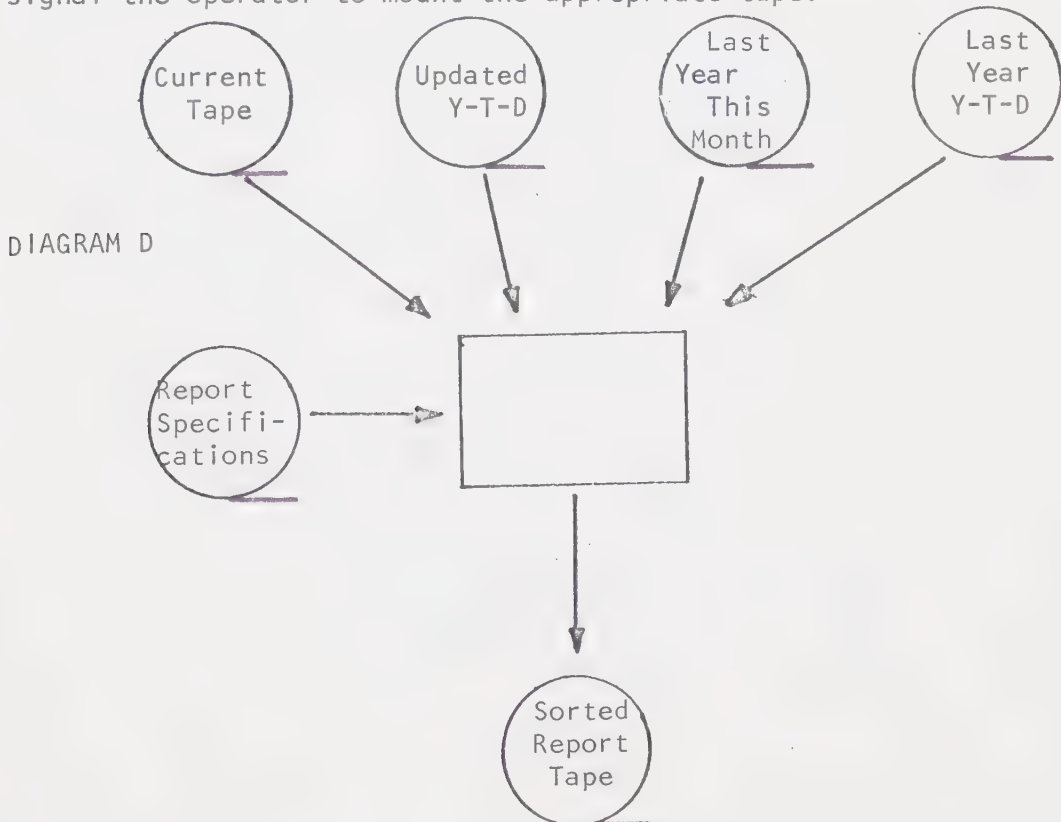
*The current entries tape may form the input to the selection run (eg. Payables)

Program No. 4. Selection Program:

This program would be run each time a report (or document) of any type was to be produced. Normal daily or monthly selections would be coded so that they would automatically be produced each cycle. One-time or infrequent reports could be stored and used only on request.

Report Specifications specified by the system user would provide the constant information to this program which would merge this information with file information to produce a Report/Document tape. The report specifications would specify sequence and format, where format falls within the "standard" type, as defined for a particular system. More complex formats or those requiring special manipulating would be processed further using some other program.

In the simplest system, one pass would be required for each set of specifications. More sophisticated programs might make several selections at a single pass. There might be the requirement for other input tapes. Those reports that do require other history tapes would fall at the end of the report specification tape and would signal the operator to mount the appropriate tape.

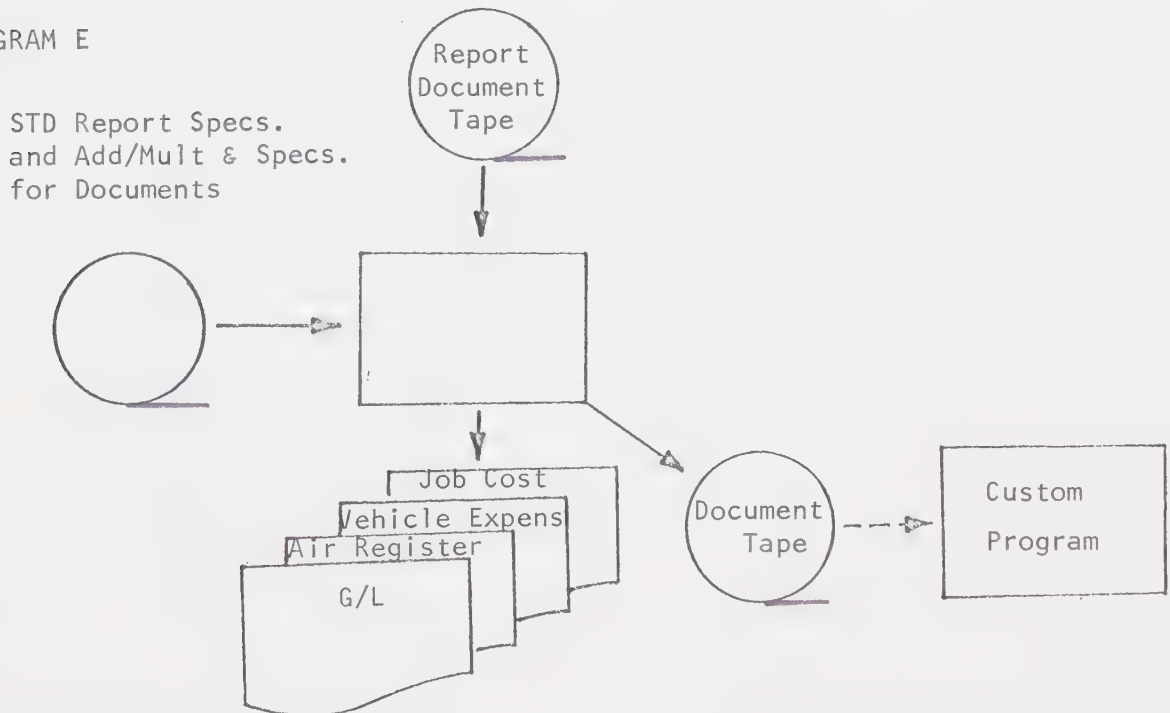


Program No. 5. Production of Reports:

In order to visualize any processing that has gone before, this, or some other specially designed program, would follow Program No. 4 in all cases.

The Production of Report program will process only the output tape of Program No. 4, as well as printing reports of standard formats. This program will perform calculations as designated by the individual report and document specifications. Its limitations as far as the complexity of the report that it will produce are programmed in during the system design. The simplest system would not do complex calculations and would have limits on the format of such things as total lines.

DIAGRAM E



APPENDIX B

A SAMPLE CHART OF ACCOUNTS

Following is the major portion of a Chart of Accounts designed and used by a Calgary-based petroleum company. It has the advantage for this study of being designed with data processing in mind. It would work very nicely with this management information system without any changes at all.

Balance Sheet Items

Assets

Current Assets

- 100 Current Cash
 - 01 Deposit Accounts
 - 02 Expense Accounts
 - 03 Petty Cash
- 101 Accounts Receivable
 - 01 From Customers, Partners, Employees
 - 01 Customers
 - 02 Partners
 - 03 Employees
 - 02 Allowance doubtful Accounts
 - 03 Accrued Receivables
 - 04 Sales Tax Refund
- 102 Marketable Securities
 - 01 Securities
 - 02 Short Term Investments
- 103 Inventories
- 104 Deposits
 - 01 Property
 - 02 Refundable Tax
- 105 Prepaid Expenses
 - 01 Rent
 - 02 Insurance
 - 03 Other

Fixed Assets

110 Work in Progress

01 Controllable Equipment

02 Non-controllable

03 Installation Costs

04 Casing

200 Surface Casing

201 Production Casing

05 Intangible Materials

06 Direct Drilling and Service Expenses

200 Footage

201 Daywork and Standby

202 Turnkey

203 Drill Bits

204 Boiler

205 Fuel and Water

206 Rig Move

207 Camp Expense

208 Directional Drilling

209 Fishing

210 Service Rig

07 Mud and Additives

08 Formation Evaluation

200 Electrical Logging

201 Nuclear Logging

202 Coring

203 Drill Stem Tests

204 Core and Fluid Analysis

09 Cementing and Completion

200 Cement - Surface Casing

201 Cement - Production Casing

202 Cement - Other

203 Casing and Tubing Testing

204 Cement Logging

205 Correlation Log

206 Perforating

207 Acidizing

208 Fracturing Service and Material

209 Displacement Oil

210 Abandonment Costs

211 Rentals

10 Lease and Roadway Expense

200 Survey

201 Location Preparation

202 Road Maintenance

203 Lease Clean-up

204 Fencing

205 Damage Claim

- 11 Supervision
 - 200 Geological
 - 201 Engineering
 - 202 Construction
 - 203 Communication
 - 204 Administrative Overhead
- 12 Geophysical/Geological
 - 200 Acquisition
 - 201 Field Work
 - 202 Processing
 - 203 Interpretation
- 13 Miscellaneous
- 14 Land Purchases
- 15 Third Party Charges
 - 200 Feasibility Study
 - 201 Engineering
 - 202 Miscellaneous
- 16 Clearance to Partners
- 17 Clearance to Company Accounts
- 111 Lands and Leases
 - 01 Producing - Acquisition Costs
 - 02 Capped Gas - Acquisition Costs
 - 03 Non-Producing - Acquisition Costs
 - 04 Other
 - 05 Producing - Land Rights Purchased
 - 06 Non-Producing - Land Rights Purchased
- 112 Exploration and Development
 - 01 Producing Oil
 - 02 Producing Gas
 - 03 Gas Plants
 - 04 Gathering Lines
 - 05 Suspended Oil
 - 06 Capped Gas
- 113 Plant and Equipment
 - 01 Producing Oil
 - 02 Producing Gas
 - 03 Gas Plants
 - 04 Gathering Lines
 - 05 Suspended Oil
 - 06 Capped Gas
 - 07 Automotive
 - 08 Buildings - Semi-Permanent
 - 09 Buildings - Permanent
 - 10 Office Furniture and Fixtures
 - 11 Leasehold Improvements
- 120 Depletion Allowance Account
- 121 Depreciation Allowance Account
- 130 Organization Expense
- 131 Deferred Charges and Credits
- 132 01 Notes Receivable - Advance to Subsidiary
 - 02 Notes Receivable - Advances - Exchange
- 133 Investment

Liabilities

Current Liabilities

- 200 01 Accounts Payable
- 02 Accrued Payables
- 03 Accrued Wages
- 201 Dividends
- 202 Provision for Income Tax
- 208 01 Investment Allocation - Partners Share
- 02 Investment Allocation - Companies Share
- 209 Budget Appropriation

Long Term

- 210 Notes Payable
- 211 Mortgage Payable

Other Liabilities

- 220 Head Office Control

Shareholder's Equity

- 221 Subscriptions Receivable
- 222 01 Preference Shares
- 02 Common Shares
- 223 01 Contributed Surplus
- 02 Retained Earnings
- 03 Dividends
- 224 Profit and Loss

Revenue and Expense

300 Revenue

- 01 Oil Sales
- 02 Gas Sales
- 03 Sulphur Sales
- 04 L.P.G. Sales
- 05 Royalty Income
- 06 Trucking
- 07 Crown Royalty - Oil
- 08 Crown Royalty - Gas
- 09 Crown Royalty - Sulphur
- 10 Freehold Royalty
- 11 Accrued Expense

350 Production Expense

- 01 Company Labour
- 02 Company Transport
- 03 Contract Operating
- 04 Fuel and Power

- 05 Repairs Maintenance
- 06 Dewaxing
- 07 Well Workover
- 08 Pump Rod Jobs
- 09 Road Lease Maintenance

APPENDIX C

MACRO DICTIONARY

AND	- a term that indicates two variables or constants enter into a logical action
BEGIN	- signal for processing to begin - used after instructions about what files, records, and fields are to be used, and the sequence of records has been established.
CALC	- (calculate) indicates some arithmetic and/or logical work is to be done - must be followed by designations of what calculations are to be prepared
DATE	- calls the current date from the system
ELSE	- a logical term that directs that if one course of action is not taken then another must be
FORMAT	- signifies that the description to follow will refer to the format or positions, on paper or some other medium, that are to be occupied by items specified in the designation column
HEADING	- indicates that variable information from the designation column or constant information from the description columns are to be used as headings, and as such will be repeated as needed when new pages are used
IF	- a logical term that indicates a decision of some sort is to be made. IF, followed by a variable or constant, is often followed by OR or AND Example: IF A OR B AND C THEN D
INCLUDE	- indicates what records are to be considered in a particular process
INPUT	- indicates which files are to be used in the processing
OR	- a logical term used in the decision process showing that an exclusive situation is to be examined Example: IF A OR B THEN C

ORDER	<ul style="list-style-type: none">- used to establish the order of records to be processed- the designation field will indicate the fields that establish the sequence of records
PAGE	<ul style="list-style-type: none">- calls the next page number to be used and the word page, so they are available to be printed
PRINT	<ul style="list-style-type: none">- gives the command to print data that has previously been formatted for printing
SUMMAR	<ul style="list-style-type: none">- (summarize) indicates the level of detail that is to be retained and reported in a particular job
THEN	<ul style="list-style-type: none">- a logical term that follows the decision process and signifies what to do under one set of conditions in the decision <p>Example: IF A OR B THEN C ELSE D</p>
TOTAL	<ul style="list-style-type: none">- indicates that totalling is to be done on fields specified in the designation column

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